THE READINESS OF MALAYSIA MEDIUM-SIZED ENTERPRISES IN MANUFACTURING SECTOR TO ADOPT INFORMATION COMMUNICATION TECHNOLOGY

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Dedicated To:

My beloved parents,

You laboured through your life to provide me the foundation of my education. All that you have worked for were to ensure I have a better future. Your words of encouragement have been great motivation for me to strive on for greater successes. I know you will be proud to know that I have kept my promise to honour your wish.

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ABSTRACT

The Government of Malaysia invested extensively to induce SMEs in the manufacturing sector to adopt ICT usage. It has encouraged them to collaborate and forge linkages with larger companies through ICT usage. Despite the Government's efforts and resources, these SMEs were not perturbed to adopt new systems. The low level of ICT adoption reported by SMIDEC posed two vital questions. (1) Do SMEs see the need to adopt ICT and are they ready to use them? (2) Do SMEs know that ICT could help them enhance their business competitiveness? None of the research done locally or overseas have taken a holistic approach to identify issues, motivators and the Stages of ICT Adoption. The objective of this research is to provide an analytical insight on SMEs, using medium-sized enterprises (MSEs) in the manufacturing sector as the research target. A quantitative survey was conducted to collate empirical data via surface mail, fax, and telephone follow-up. Out of the 1975 target respondents only 295 MSEs were qualified for this survey. Three sets of core information were derived from data analysis i.e. Barriers, Facilitators and Stages of ICT Adoption. The derived statistical evidences have proven the validity of hypotheses and the usability of ICT Adoption Identification Model (I-AIM), as they explain the MSEs predicament in ICT adoption. The MSEs ICT adoption issues were comprehensively explored, discussed and considered even from the technology suppliers' perspective. This holistic approach allows MSEs to see the value proposition and positive differentiation through the adoption of ICT. It is pragmatic to find the right business catalysts prior to venturing into ICT adoption. The proposed model has vividly illustrated a linear relationship among Barriers, Facilitators and Stages of ICT adoption. In summary, the MSEs are convinced of the ICT usefulness but they still need to be persuaded to adopt it. It is confirmed by this research that only 65% of MSEs have adopted ICT and only 5.4% of which are at Stage Four of the ICT Adoption. SMIDEC and WITSA have also reported similar findings.

ABSTRAK

Kerajaan Malaysia telah melabur dengan meluas dalam usaha untuk mendorong perusahaan kecil dan sederhana (small and medium-sized enterprises atau istilah singkat SMEs) dalam sektor pembuatan untuk menerima penggunaan ICT. Mereka telah digalakkan untuk bekerjasama dan menempa hubungan-hubungan dengan syarikat-syarikat yang lebih besar melalui penggunaan ICT. Walau bagaimanapun, disebalik segala usaha, bantuan dan dorongan dari pihak kerajaan, pihak SMEs nampaknya masih tidak begitu berminat dalam menyahut seruan kerajaan itu. Tahap rendah penerimaan ICT yang dilaporkan oleh SMIDEC telah menimbulkan dua soalan yang penting. 1) Adakah SMEs melihat ICT sebagai perlu dan adakah mereka bersedia menggunakannya? 2) Adakah pihak SMEs sedar ICT boleh membantu mereka meningkatkan daya saing dalam perniagaan mereka? Tiada penyelidikan mengenai SMEs, samada tempatan atau luar negara, pernah dibuat sehingga kini yang telah mengambil satu pendekatan menyeluruh untuk mengenalpasti isu-isu, motivasi dan peringkat penerimaan ICT. Penyelidikan ini mencuba untuk memberi satu analisa yang mendalam dengan mengambil beberapa SMEs yang sederhana (istilah singkat MSEs) di dalam bidang pembuatan sebagai sasaran. Satu kajian kuantitatif telah dikendalikan keatas 1975 MSEs menerusi surat, faks dan juga panggilan telefon susulan untuk mengumpul data empirical. Dari jumlah ini, 295 MSEs yang menepati ciri-ciri kajian ini telah dipilih. Halangan-halangan, fasilitator-fasilitator dan peringkat penerimaan ICT adalah tiga kumpulan maklumat teras yang dicari daripada kajian ini. Analisis statistik telah dijalankan bagi membuktikan sah atau tidaknya hipotesis yang dikemukakan dan juga kesesuaian "ICT Adoption Identification Model". Hasil kajian telah mengesahkan kesemua hipotesis dan model yang dicadangkan boleh menerangkan kesulitan yang dihadapi oleh MSEs dalam menerima ICT. Masaalah sebenar MSEs dalam menerima ICT telah diteliti dan dipertimbangkan dari sudut pandangan pembekal teknologi. Pendekatan menyeluruh yang diperolehi daripada penyelidikan ini mencadangkan MSEs perlu melihat nilai dan kelebihan yang boleh diperolehi melalui penggunaan ICT. Menerima ICT dalam keadaan terpaksa atau sambil lewa tidak akan membawa banyak manfaat kepada MSEs. Manakala konsep mencari suatu pemangkin perniagaan terlebih dahulu sebelum meneroka penerimaan ICT pula adalah sikap yang agak pragmatik. Model yang telah dicadangkan telah memberi suatu ilustrasi yang jelas akan hubungan linear di antara Halangan-halangan, Fasilitator-fasilitator dan Peringkat Penerimaan ICT. Ringkasnya, kebanyakkan MSEs yakin tentang kelebihan penggunaan ICT tetapi masih memerlukan lebih banyak galakkan lagi untuk menerimanya. Ini telah disahkan oleh kajian ini yang mendapati 65% MSEs telah menerima pakai ICT dan daripadanya 5.4% MSEs telah berada di peringkat keempat dalam menerima ICT. Secara kebetulan, SMIDEC dan WISTA juga teleh melaporkan hasil kajian yang serupa.

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ANS	-	Advanced Networking Services
ANOVA	-	Analysis of Variance
B2B	-	Business-to-business
B2C	-	Business-to-customers
CAGR	-	Compounded Annual Growth Rate
CIX	-	Commercial Internet Exchange
CRM	-	Customer Relationship Management system
E2E	-	Electronic-to-electronic
EDI	-	Electronic Data Interfact
ERP	-	Enterprise Resource Planning
I-AIM	-	ICT Adoption Identification Model
ICT	-	Information Communication Technology
IDC	-	International Data Corporation
IMP3	-	Third Industrial Master Plan
IT	-	Information Technology
KMO	-	Kaiser-Meyer-Olkin Measure of Sampling Adequacy
LAN	-	Local Area Network
MDC	-	The old Abbreviation of MDeC
MDeC	-	Multimedia Development Corporation Sdn. Bhd.
MIRC	-	MCA ICT Resource Centre
MITI	-	Ministry of International Trade and Industry of Malaysia
MNCs	-	Multinational Corporations
MRP	-	Material Resource Planning
MSC	-	Multimedia Super Corridor
MSEs	-	Medium-sized Manufacturing Enterprises
NPC	-	National Productivity Centre
NSDC	-	National SME Development Council

NSFNET	-	National Science Foundation Network
OEM	-	Original Equipment Manufacturer
ROI	-	Return On Investment
SCM	-	Supply Chain Management system
SMEs	-	Small and Medium Enterprises (SMEs)
SMEDP	-	Small Medium Industries Development Plan
SMI	-	Small Medium Industries
SMIDEC	-	Small Medium Industries Development Corporation
TAM	-	Technology Adoption Model
TRA	-	Theory of Reasoned Action model
USSBA	-	United States Small Business Association
WAN	-	Wide Area Network
WWW	-	Worldwide Web
WITSA	-	World Information Technology Services Alliances
r	-	Value of correlation
r_s	-	The Relationship Between Two Variables
p	-	The probability of obtaining a result
χ^2	-	Value derived from Chi Square test
df	-	Degree of Freedom
Df	-	Degree of Freedom
sig.	-	Value of Significance
t	-	Value derived from t-test
B	-	Unstandardised Coefficient
F	-	Value Determines the Likelihood that Two Variances are Different
N	-	Number of item
R	-	Pearson's R value
R^2	-	Proportion of Variability in a Data Set
Std. Error	-	Standard Error

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CHAPTER 1

INTRODUCTION

1.1 SMEs Fuelling Country Economy Growth

The fact that Small and Medium Enterprises (SMEs) are fuelling countries economic growth is evidenced by the statistics published by both the governments and organisations around the world. The United States Small Business Association (USSBA) reported to the President of the United States of America in 1998 that SMEs are an integral part of the renewal process that pervades and defines market economies (USSBA, 1998). New and small firms play a crucial role in experimentation and innovation that leads to technological change and productivity growth. The report continues to state that small firms are the essential mechanism by which millions enter the economic and social mainstream of American society. Small businesses enable millions, including women, minorities, and immigrants, to access the dream of economic growth, equal opportunity and upward mobility (USSBA, 1998).

The Government of Malaysia has always maintained that the mid-market segment in Malaysia has tremendous growth potential. The latest Census of Establishments and Enterprises 2005 conducted by the Department of Statistics reported a total of 523,132 companies in Malaysia (Department of Statistics, 2006). Of which, 99.2% or 518,996 of all enterprises enumerated were SMEs. In an earlier year, the Department of Statistics Malaysia reported in their 2000 Census that Malaysia SMEs contributed up to 40% of the country's GDP and 31.2% of the total employment in the manufacturing sector. In their Establishments and Enterprises

Census 2005 report, the output of manufacturing SMEs was valued at RM191.6 billion, which accounted for 34.9% of the whole sector output (Department of Statistics, 2006). The medium-sized SMEs (hereinafter to be referred to as MSEs) in the manufacturing sector accounted for 62.1% or RM119 billion of total SMEs output in the manufacturing sector (Department of Statistics, 2006). The total value-added contributed by SMEs in this sector was reported as RM47.5 billion. Of which, 51% or RM24.2 billion came from MSEs (Department of Statistics, 2006). However, Small Medium Industries Development Corporation (SMIDEC) in their SMEs Performance Report 2005 indicated that the total output of SMEs in the manufacturing sector was valued at RM82 billion or 29.6% of the sector output. In term of Added Value, SMEs was said to be contributing RM16.6 billion or 25.6% share of manufacturing sector (SMIDEC, 2006). When the directors in both SMIDEC and Department of Statistics were contacted for an explanation, they indicated that they are unaware of the contradicting statistics and insisted that their numbers are correct (Author's Private Communication, 2006). Although the statistics produced by the two sources differ, they nevertheless have indicated SMEs contributed significantly to the Malaysia manufacturing industries. In a more recent private communication with the SMIDEC statistics division, the officers believe the total output value stated by SMIDEC was computed based on the old SMEs definition, however they cannot confirm if the basis was indeed the reason for causing the difference (Author's Private Communication, 2007).

Under the Seventh Malaysia Plan (1996-2000), the government had transformed the manufacturing industry into a more dynamic sector with high value added, capital intensive, and high technology including skilled and knowledge-intensive industries. According to SMIDEC, SMEs are expected to contribute RM120 billion worth of manufacturing output by the year 2020 or 50 percent of the total production in the manufacturing sector. If the statistics presented by the Establishments and Enterprises Census 2005 (Department of Statistics, 2006) is correct, the output of manufacturing SMEs that was valued at RM191.6 billion (Department of Statistics, 2006) would have already exceeded the RM120 billion target. In the Eighth Malaysia Plan (2001-2005), the government has further boosted the growth in manufacturing industries with various assistance programmes. In

particular, the government encouraged more SMEs to venture into the usage of Information Communication Technology (ICT). The government provided SMEs with various types of financial assistance such as loans and grants to encourage them to acquire usage of ICT, installing Enterprise Resource Planning (ERP) application and embarking on e-commerce venture.

1.2 Development of SMEs Sector in Malaysia

The year 2005 marked the end of Small Medium Industries Development Plan (SMEDP) for the period 2001-2005, and the significant of SMEs contributing to the Malaysia economy has been increasingly recognised. Concerted effort was introduced by the Government of Malaysia to develop the SMEs sector by first establishing the Small Medium Industries Development Corporation (SMIDEC) in 1996. In the Seventh Malaysia Plan, the Government switched its effort to encourage SMEs to improve production efficiencies and entrenched them as parts and components suppliers in both the domestic and global market.

The Eight Malaysia Plan, introduced by the Government of Malaysia, for the period 2001 – 2005 had placed greater emphasis for SMEs to be more resilient and competitive. The manufacturing sector is expected to spearhead the drive to fulfil the goals of vision 2020. It is not surprising to note that at least 18 ministries and more than 70 government agencies (Hashim and Wafa, 2002) were involved in assisting the development of SMEs in Malaysia. The commitment of Government of Malaysia to develop SMEs was further amplified with the setting up of National SME Development Council (NSDC) in June 2004. The Prime Minister chaired the Council and Bank Negara acted as the Secretariat. Currently, SMEs programmes introduced by the Council are administered through 12 Ministries and 38 government agencies (SMIDEC, 2006). Stated in the Ninth Malaysia Plan 2006-2010 was a call to promote forward and backward linkages between SMEs and Multinational Corporations (MNCs) in the nation's industrial development via the support of MNCs (Economic Planning Unit of Prime Minister's Department, 2006). The call to

established online linkages signify the serious stance taken by the Government of Malaysia to develop SMEs capability to transact business online. Thus, explain the urgent needs for SMEs to adopt ICT usage.

The route and approach taken by the Malaysia Government to develop SMEs is by modernising and strengthening this sector with the required knowledge and usage of technology (SMIDEC, 2004). ICT usage was emphasised as enabler to scale SMEs up the value-chain of manufacturing industries. In fact, never before the Government of Malaysia placed such strong emphasis requiring SMEs to adopt ICT, implement e-commerce application and train their staff on ICT usage and those requirements have been reemphasised in the Ninth Malaysia Plan 2006-2010 (Economic Planning Unit of Prime Minister's Department, 2006). SMIDEC was seen to have intensified their effort though their business-matching sessions to get SMEs to link up with multinational companies and large local companies through the electronic-to-electronic (E2E) and the business-to-business (B2B) initiatives.

1.3 ICT Development Effort by MDeC for SMEs

The Government of Malaysia established Multimedia Super Corridor (MSC) in 1996 and placed it under the management of Multimedia Development Corporation Sdn Bhd (MDeC – previously know as MDC) to create a sustainable ICT industry for the country. The role of MDeC has been strategic in facilitating the development of Malaysia's national ICT projects and expediting the entry of investors into the MSC (Economic Planning Unit of Malaysia Prime Minister's Department, 2006). The mission of MDeC is to realise Malaysia as a global hub and preferred location for ICT and multimedia innovations, services and operations (MDeC, 2007). MDeC has committed to proactively collaborate with government and companies for mutual enrichment by nurturing local companies and SMEs to become global players by forging successful smart partnerships between Malaysian and International companies (MDeC, 2007).

The initial drive of MDeC was to develop software for both general and specialised applications and encourage e-commerce in Malaysia (Economic Planning Unit of Malaysia Prime Minister's Department, 2006). In the Eight Malaysia Plan (year 2001-2005), the Malaysia Government directed both the public and private sectors to build the essential ICT infrastructure for the country to be transition towards a knowledge-based economy (Economic Planning Unit of Malaysia Prime Minister's Department, 2006). Multimedia Super Corridor (MSC) was tasked to develop the enabling environment to promote the development of ICT industry to stimulate usage of ICT through wider adoption in industry and other sectors (Economic Planning Unit of Malaysia Prime Minister's Department, 2006). The effort of driving ICT usage can be clearly seen in the government sector taking the lead in computerising government services and building ICT infrastructure in various agencies.

The promotion of e-mode communication and transaction were pilot by several e-Business Programmes launched by MSC for SMEs. The aim of transforming SMEs into knowledge intensive and value creating entities has been stated in the Eight and the Ninth Malaysia Plan (Economic Planning Unit of Malaysia Prime Minister's Department, 2006). The promotion of technology and innovation driven strategies have been given greater emphasis by the Government. There is recognition on the urgent need to promote structural change in SMEs to sustain their competitiveness and their ability to participate in the integrated economy.

ICT adoption is an essential element for SMEs to reinforce their innovation capabilities and to augment their productivity and competitiveness (Economic Planning Unit of Malaysia Prime Minister's Department, 2006). The on going restructuring of the domestic industry driven by the Third Industrial Master Plan (IMP3) has been included in the Ninth Malaysia Plan in its policy thrusts to develop the innovation-driven SMEs to compete in global market (Economic Planning Unit of Malaysia Prime Minister's Department, 2006). They have given the recognition that the local SMEs should enhance their competencies, especially in ICT design and engineering skills as well as management and technical expertise to benefit from

regional and international production network. At the end of 2005, it was reported that a total of 954 SMEs have successfully adopted e-business tools to improve their operation (Bank Negara Malaysia, 2006).

1.4 Malaysia SMEs ICT Usage

Considering the fact that 96.6% of the manufacturing firms in Malaysia are SMEs and contributing to 34.9% of sector output (Department of Statistics, 2006), adoption of ICT has become a vital determining factor for local SMEs to increase their strategic survival and success. SMEs are playing the major role in Malaysia's aspiration to achieving and becoming a fully developed nation by year 2020. The Malaysian Government has constantly introduced incentives and grants to promote and upgrade SMEs in ICT usage thus developing a strong and competitive environment for them to work with large businesses (SMIDEC, 2004). In the application of ICT, the Malaysia government has implemented various grants, schemes and programmes as initiatives to SMEs to enhance their technical capabilities and to encourage greater diffusion of sophisticated technology among SMEs as an effective way to improve productivity and competitiveness (Foong, 1999). The importance of ICT to Malaysia SMEs is captured in the Second Industrial Master Plan (1996-2005) when the Government focused on developing SMEs with potential to forge linkages with larger companies in important industries such as machinery and equipment, electrics and electronics, automotive and motorcycle, marine transportation, and wood-based industries (SMIDEC, 2006). One of the thrusts indicated in the Second Industrial Master Plan (1996-2005) was to meet the challenges of globalised environment by encouraging utilisation of information intensive and knowledge driven processes for high value-added manufacturing activities (SMIDEC, 2006).

It has already become the norm that multinational companies locate their production processes in multiple locations based on costs advantage and technical capabilities. With the multiple locations setup, effective coordination of production

schedules, processes and just-in-time deliveries are extremely important. Currently, multinational companies expedited their processes on-line via the Internet. The ability to communicate orders on-line has eliminated the need to accumulate large quantity of inventory in store to keep production line running. As such, for those SMEs that planed to position themselves as Original Equipment Manufacturer (OEM) or even as sub-contractor to multinational companies, they must rapidly build up their ICT capabilities to be able to participate in the multinational companies supply chain.

In a press release by Small and Medium Industries Development Corporation (SMIDEC), dated 21st July 2003, it stated that most SMEs in Malaysia still do not posses the required technological capabilities and ability to meet manufacturing standards specified by multinational corporations and large companies (SMIDEC, 2003). SMEs were told to gear up usage of ICT to be part of the global integrated production system. It was stressed that the Just-In-Time and the global supply chain concept would require suppliers to strictly adhere to international standards in term of quality, cost and timely delivery. Adopting ICT in the manufacturing and management processes would facilitate in meeting these requirements. Failure to do so would result in SMEs losing their competitiveness and gradually being marginalised and phased out of the market. SMEs were encouraged to adopt and implement Enterprise Resource Planning system (ERP), Supply Chain Management system (SCM) and Customer Relationship Management system (CRM) in order to operate their business more efficiently, integrate their business operations, get connected to the multinational corporations and avail themselves to more business opportunities electronically.

The SMIDEC/NPC year 2003 survey reveals only 5 per cent of SMEs in Malaysia have fully automated their manufacturing processes while 75 per cent operate on a semi-automated basis (SMIDEC, 2004). Sixty nine per cent of the firms utilise their own processing methods while 22 per cent operate on licensed technology. Of the 55 per cent that have adopted ICT solutions in various aspects of their business operations, the majority utilise stand-alone rather than integrated systems (SMIDEC/NPC, 2003). Those statistics posed two vital questions: - (1) Do

Malaysia SMEs know usage of ICT can help them to increase business effectiveness? (2) Do Malaysia SMEs see the need to adopt ICT and are ready to use them?

SMEs need to integrate their manufacturing processes into their back office operations for better resources management. Enterprise Resource Planning (ERP) systems are identified as the enabling technology capable of facilitating a complete integration of the entire business organisation from production to supply chain management, sales, marketing, human resource planning and fixed assets. ICT is perceived to have the ability to build that competitive advantage for SMEs to compete in the globalise economy. Therefore, SMEs should consider ICT adoption and its usage as the entry step for taking up global challenges.

1.5 Necessity of ICT Deployment by SMEs

The trend of using computer to aid decision-making started long before microcomputer or personal computer was introduced. The earlier year research by Raymond and Magnenat-Thalmann (1982), Malone (1985), Nickell and Seado (1986), suggested that the impact of microcomputer has been basic and operational rather than decisional. Another group that carried out a similar research suggested that the main use of microcomputers had moved from record keeping (word processing and bookkeeping) to decision-making (financial modelling and data management) (Cerullo, 1980; Mahood, 1982; Malone, 1985; Commission of European Communities, 1985; Sanders, 1988). Those were the happenings in the 1980s that computers were used in closed environment where connection to the World Wide Web was an unheard phenomenon.

Computers have been successfully used in business to improve operation efficiency and productivity. Adopting new technologies has since become a necessity and a regular part of doing business especially for small manufacturers to stay competitive (Schroeder *et al*., 1989). The use of new technology can open up new market opportunities (Schroeder *et al*., 1989). Corporation managers should

learn how to adopt ICT to be competitive not merely to be fashionable. Therefore, learning how to be creative and innovative in applying new technologies will facilitate subsequent adoptions that will yield strategic advantages. It is not possible for competitors to imitate and recreate the same competitive edge by deploying the same technology (Schroeder *et al*., 1989).

The variable impacts acclaimed by companies adopted ICT usage have led to many researches conducted in this area to explain the relationship between organisation characteristics and ICT adoption. The studies conducted by Fallon and Moran (2000), IAI (2002), Matlay (2000) Matlay and Fletcher (2000), Culkin and Smith, (2000) and Riquelme (2002) have found that business size in terms of the number of employees as well as turnover is significantly associated with the adoption of ICT. Culkin and Smith (2000) suggested that larger SMEs are by nature inherently more complex and thus decisions concerning ICT acquisition require more detailed examinations of the impact of ICT. Larger SMEs tend to adopt more sophisticated systems and are often more likely to 'computerise' far more on their business than the smaller SMEs. Matlay and Fletcher (2000) noted that those findings did not appear to be localised or country-specific. Companies operating in the current economic environment often invest in ICT with the primary aim of automating internal processes such as payroll, accounting, finance, human resources, and manufacturing. MacGregor and Bunker (1996), in line with the findings of Welsh and White (1981), suggested that most SMEs are inclined to have a short-range management perspective and appeared to be more concerned with improving the day-to-day internal nature of their business than with seeking new markets or customers. Despite the sluggish progress made by SMEs in ICT adoption, the 1990s have witnessed the proliferation and hyper-growth of the Internet and Internet technologies, which together have created a global and cost-effective platform for businesses to communicate and conduct commerce (Kambil, 1995). Many companies are now using the new possibility to interact with customers electronically. This explains the necessities for SMEs to adopt ICT usage in their business operation.

The opportunity for large and midsize businesses to leverage on ICT investments is tremendous. Through ICT usage they could fundamentally reengineer

the way in which business could be done and interaction could be made with customers, suppliers, and partners. Additionally, adopting ICT will enable smaller businesses to gain the efficiencies and cost savings that once were afforded only to larger businesses (Weller, 2000). There is evidence showing SMEs around the world are embracing electronic commerce and increasing their spending on ICT. This is confirmed by the United States Small Business Administration (2000) reports that SMEs in Germany, France, and the UK spent around US$106 billion on Information Technology and Telecommunications (this is an old term that described ICT) in 1999. Similar studies are showing the same trend in other regions around the globe, such as North America, Europe and Asia (USSBA, 2000; Webb and Sayer, 1998; Le and Koh, 2002). The USSBA (2000) report stated that research has shown SMEs utilise ICT to conduct business tend to have higher revenues.

Small businesses are considered to be the fastest changing sector of e-commerce (USSBA, 1999). In fact, the proliferation of electronic commerce (e-commerce) activities is an evidence of entrepreneurs' rush to meet growing market demands. Entrepreneurs are capitalizing on e-commerce technology (USSBA, 1999). It was stated that SMEs earned US$3.5 billion in e-commerce sales during 1997 (USSBA, 1999). In the year 1999, the SBA Office of Advocacy projected e-commerce sales by SMEs will increase from US$25 billion to over US$300 billion within a decade (USSBA, 1999). In June 2000, USSBA projected that 85 per cent of the SMEs in America will conduct e-commerce over the Internet by year 2002 (USSBA, 2000). Small businesses in Germany, France, and the UK had already invested a tremendous amount on ICT in 1999, while other small businesses worldwide spent approximately US$450 billion on information technology and telecommunications (USSBA, 2000). In a market analysis conducted by IDC, they reported Malaysia SMEs spend a total of US$805.65 million on IT products and services in the year 2003 and they projected that the expenditure of the same category will reach a total of US$1,482.40 million in the year 2008 (IDC, 2004). The recent unpublished research report circulated by IDC to their subscribers indicated that IT spending for South East Asia has reached a total of US$6.29 billion in year 2006 (IDC, 2007). For which, Malaysia is a dominant contributor to that spending figure.

1.6 The Overcast of SMEs in ICT Adoption

Adopting and integrating new technology is certainly no easy matter. Schroeder *et al*. (1989) in their research findings stated that the adoption of new technology sometimes does not provide its anticipated benefits because of the lack of cost controls, shop floor management procedures, and well-trained personnel. While the new technologies replaced certain old skills, it demands an entirely new set of skills. New technology sometimes aggravates existing company problems while creating new ones.

Understanding what ICT can offer is a challenging task. New technologies are constantly being introduced and the existing technologies are refined to perfection. The capabilities of technologies adopted must match the firm's competitive strategies and the needs of its customers. Although many SMEs are embracing e-commerce, there are evidences showing that they are not utilising it to its full potential due to the existence of certain hindering factors (Webb and Sayer, 1998; O'Connor and O'Keefe, 1997; Davies and Garcia-Sierra, 1999; Timmers, 2000; Vlosky, 1999; Durlacher Research Ltd, 2000). Those factors are being described as barriers to ICT adoption in this thesis.

1.7 Research Scope

This research has selected the MSEs as research target, as they have the capacity to grow and to evolve into highly competitive firms. In the manufacturing sector scale is important, as it means capacity and ability to achieve economic of scale and MSEs are perceived to have that potential. Due to the fact that Government of Malaysia has been playing the role to improve MSEs access to overseas market through trade negotiation and bringing down trade barriers, the importance of this group of SMEs cannot be ignored. All the efforts invested by the government so far have costs the country million of ringgit, so positive return is expected. But, marketing products overseas is far more than just creating market

access. MSEs need to be competitive in the global market place. They need to transform themselves in their products features, production processes and keeping abreast with market requirements in the global market place. The process requires a change in the mindset of MSEs in the deployment of ICT to upgrade the process of managing materials supply, marketing and distribution of products and maintaining customers loyalty.

Many researches done on the Malaysia SMEs tend to cover a broad spectrum of issues (Ghazali and Shaari, 1988; Mohd Jan *et al.*, 1990; Foong, 1999; Hashim and Wafa, 2002). But, in the area of ICT adoption by Malaysia SMEs, there have only been a handful of researches touched on the subject of ICT adoption, and if there are more of such researches in existence they are certainly not published. The author has searched through the possible sources of research that may have conducted on Malaysia MSEs and none is found. The published researches tend to point out issues and problems and yet none has attempted to identify the factors and methodologies that could lead SMEs to their readiness in adopting ICT. It is time that a research is done in this area on the Malaysia SMEs, and to spur the interest of other researchers to continue exploring this subject. As such, the key focus of this thesis will be on the readiness of Malaysia medium-sized enterprises (MSEs) in the manufacturing sector to adopt ICT usage.

In pursuing the reason on why SMEs are slow to adopt ICT usage, this study has given prior recognition to the characteristics of SMEs stated in a report by the Organisation for Economic Co-operation and Development (OECD, 2004). The main characteristics of SMEs are listed below:

- They are mostly owner-managed family business.
- The owner management style significantly influence and affect decision-making process and problems solving.
- They are largely local in its area of operations and located in the vicinity of large companies.
- They are largely dependent on internal sources of capital to finance its growth.

Those are the underlying hard facts attached to all SMEs throughout the world and they should reflect fairly on the Malaysia SMEs.

This research focuses on the medium category of SMEs in the manufacturing sector (MSEs). As defined by the Secretariat to National SME Development Council, SMEs falling under this category are with a sales turnover between RM10 million and RM25 million or has number of full time employees between 51 and 150 (Bank Negara Malaysia, 2005). The manufacturing sector is targeted in this research for its economic significance and importance in the country. It is a sector that the Malaysia Government has placed great expectation for its industrialization program to achieve Vision 2020. Although this sector only has 37,886 small and medium sized firms as reported by the Department of Statistics of Malaysia in their Establishments and Enterprises Census 2005 (Department of Statistics, 2006), its contribution to country's economy cannot be ignored. Of the 37,886 manufacturing SMEs establishments reported, only 1,959 establishments are classified as MSEs and they account for 62.1% of total SMEs output in the manufacturing sector (Department of Statistics, 2006). In 1996, SMEs of this sector already accounted for 22.1% of Malaysia manufacturing sector output, 19.5% of value-added and 29.6% of manufacturing sector employment. In 2005, this sector has increased their share in the manufacturing sector output to 29.0% and to 25.9% in value-added and employed 31.1% of the country total workforce. Total number employed by SMEs in year 2005 was 395,670 (Department of Statistics, 2006).

Smaller SMEs with sales turnover and full time employees less than the parameter mentioned in the preceding paragraph are excluded from this research. This is because smaller manufacturing firms do not need the defined formal organisation structure to facilitate systematic workflow. In the condition of having a transitional organisation structure, it is unlikely for smaller firms to consider a full fledge ICT usage (Matlay and Fletcher, 2000), as their organisation structure is unstable and is unsuitable for the purpose of this research. Medium sized firm that employed between 50 to 150 employees (as per National SMEs Development Council's definition) are more likely to establish various management functional areas, and are large enough to merit installation of formal organisation structure. It is

envisaged that MSEs have the tendency to adopt and adapt more sophisticated management practice and are more likely to expand their capability through acquiring new technology, and resourced up manpower to improve business performance (Fallon and Moran, 2000; IAI, 2002; Matlay, 2000; Matlay and Fletcher, 2000; Culkin and Smith, 2000 and Riquelme, 2002).

MSEs are selected for the reason that they are often closely linked with larger firms as sub-contractors, components or parts manufacturer for the ultimate manufacturers. As sub-contractor, they manufacture products according to the specification provided by large enterprises. According to a study conducted by the Economic and Social Commission for Asia and Pacific, medium-sized enterprises of this category tend to locate nearer to cities and ports with well developed infrastructure facilities and are near to their customers (Economic and Social Commission for Asia and Pacific, 1992).

Medium-sized enterprises of the category mentioned often have highly demanding operations due to the challenges poised by their customers that compelled them to meet the required quality, price and growth in volume. Enterprises of this category need adaptation to constant change, new systems, new skills and technology (Poutziouris *et al.*, 2000). The management of medium-sized enterprises is perceived to be more capable as a result of their experience in running larger enterprise that often need them to tactically manoeuvre their operation with certain competitive strategy to compete in the market.

For the purpose of this research, all the identified Malaysia MSEs (population for this category reported by Department of Statistics in their Establishment Survey 2005 is 1,959) in the manufacturing sector are included as potential targets for the questionnaire survey. It is expected that the sample of selected MSEs will consist of the following three categories: - (1) subsidiaries of foreign multinationals, (2) subsidiaries that are wholly owned by large local organizations, and (3) MSEs that are privately owned. Although firms of the first and second category also meet the description of MSEs, in practice they are not autonomous operation and often fall back on the expertise and resources of their parent company. With the backing and

support of their parent company, the MSEs that are subsidiaries of large companies will present some identifiable differences from those independently owned MSEs in term of management philosophy and the use of operating procedures. This thesis will not distinguish ICT usage by MSEs of the three categories. This is because the author believes ICT usage and adoption in MSEs are driven out of business needs and not out of business ownership. However, the author recognised the fact that to a certain extend subsidiaries of larger companies are more likely to implement ICT solutions due to their parent company directives. For the local MSEs that adopted ICT, it is certain that they did it out of their own business requirements. As such, the policies, procedures and practices on ICT usage are entirely developed out of their own initiatives.

1.8 Research Objectives

Five distinct objectives are established to guide the effort of this research. These objectives serve to drive the focus and to identify a holistic account of ICT adoption issues from the earlier findings and relate them to problems confronting MSEs in Malaysia with regard to the stages of ICT adoption. The following is a summary of research objectives.

- This research will examine changing strategic management philosophy of SMEs in adoption of ICT usage. Literature on MSEs specific in this area is very rare, so the published SMEs literatures are examined for this purpose. Changes in this area could be seen in the manufacturing industry whereby factory processes are being integrated with back office operations for better resource management. With the introduction of RosettaNet in year 2002, it has led some SMEs to venture across national frontiers to secure new market opportunities.
- Although SMEs are embracing ICT, there are strong evidences that they are not utilising it to the full potential due to the existence of certain hindering factors. This research will identify the factors that hinder and drive MSEs from and into adopting usage of ICT.
- As new technologies are constantly being introduced and the existing technologies are refined to perfection, there must be some compelling factors that

could entice SMEs into using ICT. This research will identify the unique catalysts that could spur SMEs into adopting ICT usage or upgrading their current systems to more sophisticated systems.

- The relationship among the factors that hinder and promote ICT usage and their impact on the stages of ICT adoption will be revealed and assembled into a perspicacious model to explain the interplaying factors. The model will be used to evaluate, analyse, identify and explain ICT adoption opportunity.
- During the course of this research, the author has not come across any research publication on MSEs on ICT adoption. It is thus the desire of the author that this research will spur the interest of other researchers to explore this subject and test the usability of the proposed model.

1.9 Problem Statement

Many organisations have invested significant effort to encourage SMEs into using ICT. However, SMEs seem to be reluctant in using ICT. Many researches have already been conducted to prove the benefits of SMEs adopting ICT. Some researches have gone to the extent to prove ICT has radically changed the way business is conducted by SMEs. Not only ICT has affected the way organisations organised their business activities internally but also in their approach to inter-organisational dealings. In a comparative research done by MacGregor and Vrazalic (2004), they concluded in their findings that the most significant benefit derived by SMEs from adopting ICT was increased internal efficiency, which translated into cost savings and streamlined business operation. However, the puzzling fact remains that the Malaysia SMEs in the manufacturing sector are still slow in adopting ICT; a low adoption rate is still being reported by SMIDEC (SMIDEC, 2004).

Although the Malaysia SMEs in the manufacturing sector have been vigorously persuaded, induced, coerced and encouraged by the various government ministries and development agencies to adopt ICT, only 5% of SMEs have

implemented fully integrated systems (SMIDEC, 2004). Various reasons have been offered to explain the low ICT take on rate by SMEs in Malaysia, but none has universally explained the unenthusiastic attitude of SMEs. Under the SMIDEC SMEs development programmes, incentives were introduced to assist SMEs to overcome the obvious ICT adoption resistance and which have yet to cause a change in momentum in the exercise (SMIDEC, 2006).

Attitude of low enthusiasm in deploying ICT has been singled out as the main explanation for low ICT deployment. The most general common comment heard was that ICT in use by SMEs is often outdated. According to Chee (1986), some small firms do not trust new technology whilst others are not able to afford it. Ghazali and Shaari (1988) suggested that SMEs do not normally use the latest technologies that are available in the market. Another survey done by Mohd Jan *et al*. (1990) indicated that SMEs in Malaysia are not aware of new technology, as they have limited accessibility and knowledge of the latest ICT. The issues highlighted in those researches preceded the well-known fact of inadequate in-house expertise and financial constraints.

The predicaments of ICT adoption are too wide ranging to be reviewed singly. This research will attempt to identify a holistic account of the earlier findings on ICT adoption issues and relate them to problems confronting the MSEs as stages of ICT adoption. Besides examining the factors that hinder SMEs in ICT adoption which are defined as barriers, this thesis will also identify the unique catalysts that could spur MSEs into adopting information technology usage or upgrading the current systems for more sophisticated systems. The catalysts are defined as Facilitators. The relationship between the stages of ICT adoption and the factors that hinder and promote ICT adoption will be examined via the following seven hypotheses presented below.

Hypothesis 1: ICT Adoption occurs in linear or sequential order. It is a natural progression to the next level of ICT sophistication as the foundation of previous stage has been completed and resources are made available.

Hypothesis 2: Attitudes, Awareness, Behavioural and Emotional factors are generally barriers to the earlier stages of ICT adoption. Their strength of influence as barriers becomes less significant as MSEs moves up the stages of ICT Adoption.

Hypothesis 3: Technical and Infrastructural factors are less of a consideration at lower stage of ICT adoption. The factors categorised under this grouping become major influence as MSEs move up the stages of ICT adoption.

Hypothesis 4: The relationship between Attitude, Awareness, Behavioural and Emotional factors and Technical and infrastructural factors are inversely related.

Hypothesis 5: Facilitators of the early ICT Adoption stages mostly related to the needs to address operational issues. The main focus at the lower stage is to improve organisational efficiencies, productivity and costs control.

Hypothesis 6: Strategic and competitive factors are the main reasons for MSEs to move up to the higher stage of ICT Adoption.

Hypothesis 7: The relationship between Strategic and Operational facilitators are inversely related.

1.10 Expected Contributions of this Study

This research aims to set a foundation for analysing ICT Adoption issues confronted by MSEs in Malaysia. It will contribute to further understanding of the identifiable factors that are holding back the Malaysia MSEs from adopting ICT. This is a subject that has caused many Ministries and Government agencies to invest significant effort, money and time. It is an area of great interest to many ICT

vendors who have spent millions on promotions and advertisements to entice SMEs to buy their systems. This study will reveal the relationship between MSEs ICT adoption and their focus on business. Because of the prominent and growing role of MSEs in the Malaysia economy, understanding the extent of their ICT adoption effort is a worthwhile research project.

The output from this research will be a practical approach to explain the relationship between Stages of ICT Adoption and factors that hinders or promote ICT adoption. The summation of this thesis will be a holistic model that encapsulates the challenges confronted by MSEs and their struggle to move up the stages of ICT adoption. It is the intention of this thesis to provide technology suppliers good insight through the use of derived models to identify unique catalyst that could inspire MSEs into accelerating their systems adoption.

As limited researches of this nature have been done in Malaysia on SME readiness to adopt ICT, and similar research on MSEs is almost non-existence, it is expected that a research of this kind should be done to spur the interest of other researchers to continue exploring this area of study.

1.11 Thesis Outline

This thesis consists of seven chapters. Chapter 1 is an introduction to the scope of this research project. In this chapter the problem statements and objectives of this research are specified and defined to provide an outline for this study.

Chapter 2 summarises the work done in reviewing selected literatures related to the subject of this research project. The topics reviewed encompassed the various previous works done in ICT adoption and SMEs. This chapter examines the unique nature of SMEs and challenges posed by ICT adoption. The view of various

researchers are summarised here for better understanding of the issues intended to be resolved in this research.

Chapter 3 evaluates the usability of the established models and their theoretical background with the view to adopt them for explaining the issues presented by this research. The discussions in this chapter lead to the proposed development of ICT Adoption Identification Model. The proposed model will illustrate issues surrounding MSEs ICT adoption and presenting the relationships between stages of ICT adoption and the factors that hinder and promote ICT adoption.

Chapter 4 outline the research design and methodology. It covers research design, questionnaire design, sample selection and the approach to survey implementation.

Chapter 5 analyses and reports the outcome of this survey and to provide understanding of the results obtained. Various statistical tests are performed here to illustrate the relationship of the factors and the proposed model. The survey findings obtained will be used to validate the hypotheses presented in Chapter 1 and will be use to confirm the plausibility of proposed model in providing holistic explanation to MSEs ICT adoption.

Chapter 6 discusses the findings reported in Chapter 5 and revisits the literatures presented in previous chapters and deliberate them with the current findings. This chapter uses the output of previous chapters and the model developed to describe how MSEs could shape their ICT adoption initiatives. The Malaysia MSEs ICT adoption is revisited here using the survey results.

Chapter 7 concludes the work of this research with recommendations. This chapter will provide guidelines and approaches to promote ICT adoption in MSEs sectors using the proposed ICT Adoption Identification model in conjunction with the proposed explanatory models.

1.12 Summary

In summary, this chapter establishes the urgent need for a research to be done on Malaysia MSEs in the area of ICT adoption and to set a basis for venturing into the broader SMEs arena on the subject matter. The research scope and objectives provided in the earlier sections will pave the way and set the boundaries for this research to be conducted. It is expected that the research questions will be fully answered, as the hypotheses laid down are proven plausible, by the time this thesis is completed. Appropriate measures will be instituted to ensure the integrity of this research by defining research constructs, hypotheses, and measures to avoid deception, and to provide anyone who read this thesis with the necessary data to support the conclusion drawn.

In the next chapter on literature review, the relevant studies and researches that were done on SMEs and in the area of ICT Adoption will be examined for their applicability to this research. Due to the lack of published articles on MSEs in ICT adoption, the author will not be able to specifically cite research finding on MSEs. However, MSEs as a significant subset of SMEs, in term of their economic contribution, are perceived to have a considerable impact on the behaviour and influence on ICT adoption revealed by previous researches.

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